Tutor :

Nuno Ricardo Barroso de Freitas

`https://www.icmat.es/miembros/nfreitas/`

Method :

Online meetings.

Language :

English, Spanish or Portuguese

Project Title :

Introduction to Arithmetic Groups

Summary :

Arithmetic groups arise naturally in the study of arithmetic properties of quadratic forms and other classical topics in number theory. They also play a central rôle in the subject of automorphic forms and the Langlands program which is a fundamental research subject in modern number theory. They are also used to construct examples of Riemannian manifolds and hence are objects of interest in differential geometry and topology.

The purpose of this project is to give the student a brief introduction to arithmetic groups.

We start with an introduction to algebraic groups over $\mathbb{Q}$ and arithmetic subgroups, describing Siegel sets and reduction theory (illustrating via the reduction theory of quadratic forms). We will state and overview the ideas of some fundamental results like the Borel-Harish-Chandra theorem, Godement's compactness criterion, and Borel's density theorem. Finally we discuss co-volumes of arithmetic subgroups and masses of quadratic lattices, and we will study example of arithmetic hyperbolic 3-manifold.